

WHAT IS CLAIMED IS:

1. A liquid crystal panel comprising:  
a first substrate;  
a second substrate;  
a liquid crystal provided between the first substrate and the second substrate;  
a plurality of gap holding members provided between the first substrate and the second substrate; and  
a microlens array including a plurality of microlenses, wherein  
the microlens array is provided in the first substrate at a side opposite to the second substrate.

2. A liquid crystal panel comprising:  
a first substrate including a plurality of pixel electrodes;  
a second substrate including a counter electrode;  
a liquid crystal;  
a plurality of gap holding members; and  
a microlens array including a plurality of microlenses, wherein:  
the first substrate faces the second substrate through the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and  
the microlens array is provided in the first substrate at a side opposite to the second substrate.

3. A liquid crystal panel comprising:

a first substrate including a plurality of pixel electrodes;  
a second substrate including a counter electrode;  
a liquid crystal;  
a plurality of gap holding members; and  
a microlens array including a plurality of microlenses, wherein:  
the first substrate faces the second substrate through the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and  
the microlens array is provided in the second substrate at a side opposite to the first substrate.

4. A liquid crystal panel comprising:  
a first substrate including a plurality of pixel electrodes;  
a second substrate including a counter electrode;  
a liquid crystal;  
a plurality of gap holding members; and  
a microlens array including a plurality of microlenses, wherein:  
the first substrate faces the second substrate through the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and  
the microlens array is provided on a surface of the second substrate, the surface being opposite to a surface that faces the first substrate.

5. A liquid crystal panel comprising:  
a first substrate including a plurality of pixel electrodes;  
a second substrate including a counter electrode;

a liquid crystal;

a plurality of gap holding members; and

a microlens array including a plurality of microlenses, wherein:

the first substrate faces the second substrate through the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and

the microlens array is provided on a surface of the first substrate, the surface being opposite to a surface that faces the second substrate.

6. A liquid crystal panel comprising:

a first substrate including a plurality of thin film transistors and a plurality of pixel electrodes;

a second substrate including a counter electrode;

a liquid crystal;

a plurality of gap holding members; and

a microlens array including a plurality of microlenses, wherein:

the first substrate faces the second substrate through the plurality of thin film transistors, the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and

the microlens array is provided in the first substrate at a side opposite to the second substrate.

7. A liquid crystal panel comprising:

a first substrate including a plurality of thin film transistors and a plurality of pixel electrodes;

a second substrate including a counter electrode;

a liquid crystal;

a plurality of gap holding members; and

a microlens array including a plurality of microlenses, wherein:

the first substrate faces the second substrate through the plurality of thin film transistors, the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members; and

wherein the microlens array is provided in the second substrate at a side opposite to the first substrate.

8. A liquid crystal panel comprising:

a first substrate including a plurality of thin film transistors and a plurality of pixel electrodes;

a second substrate including a counter electrode;

a liquid crystal;

a plurality of gap holding members; and

a microlens array including a plurality of microlenses, wherein:

the plurality of thin film transistors control potentials applied to the plurality of pixel electrodes;

the first substrate faces the second substrate through the plurality of thin film transistors, the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members;

the microlens array is provided on a surface of the second substrate, the surface being opposite to a surface that faces the first substrate; and

the plurality of microlenses are provided on one-on-one basis with respect to the plurality of pixels.

9. A liquid crystal panel comprising:

a first substrate including a plurality of thin film transistors and a plurality of pixel electrodes;

a second substrate including a counter electrode;

a liquid crystal;

a plurality of gap holding members; and

a microlens array including a plurality of microlenses, wherein:

the plurality of thin film transistors control potentials applied to the plurality of pixel electrodes;

the first substrate faces the second substrate through the plurality of thin film transistors, the plurality of pixel electrodes, the counter electrode, the liquid crystal, and the plurality of gap holding members;

the microlens array is provided on a surface of the first substrate, the surface being opposite to a surface that faces the second substrate; and

the plurality of microlenses are provided on one-on-one basis with respect to the plurality of pixels.

10. A liquid crystal panel according to any one of claims 6, wherein:

each of the plurality of thin film transistors includes a semiconductor film including a source region, a drain region, and a channel formation region;

the source regions or the drain regions of the plurality of thin film transistors are respectively

connected to the plurality of pixel electrodes at contact portions; and  
the plurality of gap holding members are provided over the contact portions.

11. A liquid crystal panel according to any one of claims 7, wherein:  
each of the plurality of thin film transistors includes a semiconductor film including a source region, a drain region, and a channel formation region;  
the source regions or the drain regions of the plurality of thin film transistors are respectively connected to the plurality of pixel electrodes at contact portions; and  
the plurality of gap holding members are provided over the contact portions.

12. A liquid crystal panel according to any one of claims 8, wherein:  
each of the plurality of thin film transistors includes a semiconductor film including a source region, a drain region, and a channel formation region;  
the source regions or the drain regions of the plurality of thin film transistors are respectively connected to the plurality of pixel electrodes at contact portions; and  
the plurality of gap holding members are provided over the contact portions.

13. A liquid crystal panel according to any one of claims 9, wherein:  
each of the plurality of thin film transistors includes a semiconductor film including a source region, a drain region, and a channel formation region;  
the source regions or the drain regions of the plurality of thin film transistors are respectively connected to the plurality of pixel electrodes at contact portions; and  
the plurality of gap holding members are provided over the contact portions.

14. A liquid crystal panel according to any one of claims 1, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

15. A liquid crystal panel according to any one of claims 2, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

16. A liquid crystal panel according to any one of claims 3, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

17. A liquid crystal panel according to any one of claims 4, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

18. A liquid crystal panel according to any one of claims 5, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

19. A liquid crystal panel according to any one of claims 6, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

20. A liquid crystal panel according to any one of claims 7, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

21. A liquid crystal panel according to any one of claims 8, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

22. A liquid crystal panel according to any one of claims 9, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

23. A liquid crystal panel according to any one of claims 1, wherein a side of each of the plurality of gap holding members is taper-shaped.

24. A liquid crystal panel according to any one of claims 2, wherein a side of each of the plurality of gap holding members is taper-shaped.

25. A liquid crystal panel according to any one of claims 3, wherein a side of each of the plurality of gap holding members is taper-shaped.

26. A liquid crystal panel according to any one of claims 4, wherein a side of each of the plurality of gap holding members is taper-shaped.



27. A liquid crystal panel according to any one of claims 5, wherein a side of each of the plurality of gap holding members is taper-shaped.

28. A liquid crystal panel according to any one of claims 6, wherein a side of each of the plurality of gap holding members is taper-shaped.

29. A liquid crystal panel according to any one of claims 7, wherein a side of each of the plurality of gap holding members is taper-shaped.

30. A liquid crystal panel according to any one of claims 8, wherein a side of each of the plurality of gap holding members is taper-shaped.

31. A liquid crystal panel according to any one of claims 9, wherein a side of each of the plurality of gap holding members is taper-shaped.

32. A liquid crystal panel according to any one of claims 1, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

33. A liquid crystal panel according to any one of claims 2, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

34. A liquid crystal panel according to any one of claims 3, wherein each of the plurality of

gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

35. A liquid crystal panel according to any one of claims 4, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

36. A liquid crystal panel according to any one of claims 5, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

37. A liquid crystal panel according to any one of claims 6, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

38. A liquid crystal panel according to any one of claims 7, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

39. A liquid crystal panel according to any one of claims 8, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

40. A liquid crystal panel according to any one of claims 9, wherein each of the plurality of

gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

41. A liquid crystal panel according to any one of claims 1, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

42. A liquid crystal panel according to any one of claims 2, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

43. A liquid crystal panel according to any one of claims 3, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

44. A liquid crystal panel according to any one of claims 4, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

45. A liquid crystal panel according to any one of claims 5, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

46. A liquid crystal panel according to any one of claims 6, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

47. A liquid crystal panel according to any one of claims 7, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

48. A liquid crystal panel according to any one of claims 8, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

49. A liquid crystal panel according to any one of claims 9, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

50. A liquid crystal panel according to any one of claims 1, wherein the liquid crystal panel sizes diagonally 1 inch or less.

51. A liquid crystal panel according to any one of claims 2, wherein the liquid crystal panel sizes diagonally 1 inch or less.

52. A liquid crystal panel according to any one of claims 3, wherein the liquid crystal panel sizes diagonally 1 inch or less.

53. A liquid crystal panel according to any one of claims 4, wherein the liquid crystal panel sizes diagonally 1 inch or less.

54. A liquid crystal panel according to any one of claims 5, wherein the liquid crystal panel sizes diagonally 1 inch or less.

55. A liquid crystal panel according to any one of claims 6, wherein the liquid crystal panel sizes diagonally 1 inch or less.

56. A liquid crystal panel according to any one of claims 7, wherein the liquid crystal panel sizes diagonally 1 inch or less.

57. A liquid crystal panel according to any one of claims 8, wherein the liquid crystal panel sizes diagonally 1 inch or less.

58. A liquid crystal panel according to any one of claims 9, wherein the liquid crystal panel sizes diagonally 1 inch or less.

59. A liquid crystal panel according to any one of claims 1, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

60. A liquid crystal panel according to any one of claims 2, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

61. A liquid crystal panel according to any one of claims 3, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

62. A liquid crystal panel according to any one of claims 4, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

63. A liquid crystal panel according to any one of claims 5, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

64. A liquid crystal panel according to any one of claims 6, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

65. A liquid crystal panel according to any one of claims 7, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

66. A liquid crystal panel according to any one of claims 8, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

67. A liquid crystal panel according to any one of claims 9, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/10$  or less of a condensing peak of the microlens.

68. A liquid crystal panel according to any one of claims 1, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

69.A liquid crystal panel according to any one of claims 2, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

70.A liquid crystal panel according to any one of claims 3, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

71.A liquid crystal panel according to any one of claims 4, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

72.A liquid crystal panel according to any one of claims 5, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

73.A liquid crystal panel according to any one of claims 6, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

74.A liquid crystal panel according to any one of claims 7, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

75. A liquid crystal panel according to any one of claims 8, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

76. A liquid crystal panel according to any one of claims 9, wherein the plurality of gap holding members are provided in a region where light intensity becomes  $1/20$  or less of a condensing peak of the microlens.

77. A liquid crystal projector comprising:

- a white light source;
- splitting means for splitting white light emitted from the white light source into a plurality of lights having different colors;
- a plurality of liquid crystal panels respectively corresponding to the plurality of lights;
- first optical means for irradiating the plurality of lights to the plurality of corresponding liquid crystal panels; and
- second optical means for condensing a plurality of transmitted lights transmitted through the plurality of liquid crystal panels, wherein:
  - at least one of the plurality of liquid crystal panels includes a first substrate and a second substrate;
  - the plurality of lights are irradiated from a side of the second substrate to the liquid crystal panel;
  - a plurality of gap holding members are provided between the first substrate and the second substrate; and
  - a microlens array is provided at a side of the second substrate where the plurality of lights are



irradiated.

78. A liquid crystal projector comprising:  
a white light source;  
splitting means for splitting white light emitted from the white light source into a plurality of lights having different colors;  
a plurality of liquid crystal panels respectively corresponding to the plurality of lights;  
first optical means for irradiating the plurality of lights to the plurality of corresponding liquid crystal panels; and  
second optical means for condensing a plurality of transmitted lights transmitted through the plurality of liquid crystal panels, wherein:  
at least one of the plurality of liquid crystal panels includes a first substrate and a second substrate;  
the plurality of lights are irradiated from a side of the second substrate to the liquid crystal panel;  
a plurality of pixels are provided on the first substrate;  
each of the plurality of pixels includes a pixel electrode and a thin film transistor connected to the pixel electrode;  
a plurality of gap holding members are provided between the first substrate and the second substrate;  
a microlens array is provided at a side of the second substrate where the plurality of lights are irradiated; and  
a plurality of microlenses included in the microlens array are provided on one-on-one basis with respect to the plurality of pixels.

79. A liquid crystal projector comprising:  
a white light source;  
splitting means for splitting white light emitted from the white light source into a plurality of lights having different colors;  
a plurality of liquid crystal panels respectively corresponding to the plurality of lights;  
first optical means for irradiating the plurality of lights to the plurality of corresponding liquid crystal panels; and  
second optical means for condensing a plurality of transmitted lights transmitted through the plurality of liquid crystal panels, wherein:  
at least one of the plurality of liquid crystal panels includes a first substrate and a second substrate;  
the plurality of lights are irradiated from a side of the second substrate to the liquid crystal panel;  
a pixel portion including a plurality of pixels is provided on the first substrate;  
each of the plurality of pixels includes a pixel electrode and a thin film transistor connected to the pixel electrode;  
a plurality of gap holding members are provided between the pixel portion and the second substrate;  
a microlens array is provided at a side of the second substrate where the plurality of lights are irradiated; and  
a plurality of microlenses included in the microlens array are provided on one-on-one basis with respect to the plurality of pixels.

80. A liquid crystal projector according to claim 78, wherein:

the thin film transistor included in each of the plurality of pixels includes a semiconductor film including a source region, a drain region, and a channel formation region;

the source regions or the drain regions are respectively connected to the plurality of pixel electrodes at contact portions; and

the plurality of gap holding members are provided over the contact portions.

81. A liquid crystal projector according to claim 79, wherein:

the thin film transistor included in each of the plurality of pixels includes a semiconductor film including a source region, a drain region, and a channel formation region;

the source regions or the drain regions are respectively connected to the plurality of pixel electrodes at contact portions; and

the plurality of gap holding members are provided over the contact portions.

82. A liquid crystal projector according to any one of claims 77, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

83. A liquid crystal projector according to any one of claims 78, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

84. A liquid crystal projector according to any one of claims 79, wherein each of the plurality of gap holding members has a shape selected from the group consisting of a circular column shape, an elliptical column shape, and a polygonal column shape.

85. A liquid crystal projector according to any one of claims 77, wherein a side of each of the plurality of gap holding members is taper-shaped.

86. A liquid crystal projector according to any one of claims 78, wherein a side of each of the plurality of gap holding members is taper-shaped.

87. A liquid crystal projector according to any one of claims 79, wherein a side of each of the plurality of gap holding members is taper-shaped.

88. A liquid crystal projector according to any one of claims 77, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

89. A liquid crystal projector according to any one of claims 78, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

90. A liquid crystal projector according to any one of claims 79, wherein each of the plurality of gap holding members contains a material selected from the group consisting of polyimide, acryl, polyamide, polyimidoamide, and epoxy resin.

91. A liquid crystal projector according to any one of claims 77, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

92. A liquid crystal projector according to any one of claims 78, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

93. A liquid crystal projector according to any one of claims 79, wherein each of the plurality of gap holding members contains one of an ultraviolet ray curing resin and a thermosetting resin.

94. A liquid crystal projector according to any one of claims 77, wherein the liquid crystal panel sizes diagonally 1 inch or less.

95. A liquid crystal projector according to any one of claims 78, wherein the liquid crystal panel sizes diagonally 1 inch or less.

96. A liquid crystal projector according to any one of claims 79, wherein the liquid crystal panel sizes diagonally 1 inch or less.